



# Chapter 2A “FRAPPY”

## {Free Response AP Problem...Yay!}

The following problem is taken from an actual Advanced Placement Statistics Examination. Your task is to generate a complete, concise statistical response in 15 minutes. You will be graded based on the AP rubric and will earn a score of 0-4. After grading, keep this problem in your binder for your AP Exam preparation.

A professional sports team evaluates potential players for a certain position based on two main characteristics, speed and strength.

(a) Speed is measured by the time required to run a distance of 40 yards, with smaller times indicating more desirable (faster) speeds. From previous speed data for all players in this position, the times to run 40 yards have a mean of 4.60 seconds and a standard deviation of 0.15 seconds, with a minimum time of 4.40 seconds. Based on the relationship between the mean, standard deviation, and minimum time, is it reasonable to believe that the distribution of 40-yard running times is approximately normal? Explain.

(b) Strength is measured by the amount of weight lifted, with more weight indicating more desirable (greater) strength. From previous strength data for all players in this position, the amount of weight lifted has mean of 310 pounds and a standard deviation of 25 pounds. Calculate and interpret the z-score for a player in this position who can lift a weight of 370 pounds.

### Scoring:

E P I

(c) The characteristics of speed and strength are considered to be of equal importance to the team in selecting a player for the position. Based on the information about the means and standard deviations of the speed and strength data for all players and the measurements listed in the table below for Players A and B, which player should the team select if the team can only select one of two players? Justify your answer.

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	Player A	Player B
Time to run 40 yards	4.42 seconds	4.57 seconds
Amount of weight lifted	370 pounds	375 pounds

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Total: \_\_\_/4

**AP Statistics      Problem Set #3**

- 1. POTATO CHIPS** The distribution of weights of 9-ounce bags of a particular brand of potato chips is approximately normal with mean  $\mu = 9.12$  ounces and standard deviation  $\sigma = 0.15$  ounce.
- Draw an accurate sketch of the distribution of potato chip bag weights. Be sure to label the mean, as well as the points one, two, and three standard deviations away from the mean on the horizontal axis.
  - A bag weighs 8.97 ounces is at what percentile in this distribution? If you were a consumer, is that a good thing or not? Explain.
  - What percent of 9-ounce bags of this brand of potato chips weigh between 8.67 ounces and 9.27 ounces?

- 2. WINTER OLYMPICS 2002 DOWNHILL** Fifty-three men qualified for the men's alpine downhill race in Salt Lake City. The gold medal winner finished in 1 minute and 39.13 seconds (99.13 seconds). All competitors' times (in seconds) are found in the following list:

99.13   99.35   99.41   99.78   99.96   100.00   100.30   100.31   100.37   100.39   100.58   100.74  
 100.74   100.76   100.81   100.84   100.85   101.05   101.24   101.25   101.27   101.56   101.66   101.69  
 101.70   101.76   101.84   101.85   101.86   101.86   101.88   102.15   102.31   102.52   102.54   103.04  
 103.19   103.20   103.33   103.63   103.73   103.75   104.35   105.25   105.34   105.49   106.36   107.63  
 107.65   108.37   108.84   109.75   114.42

- The mean time was 102.71, with a standard deviation of 3.01 seconds. If the Normal model is appropriate, what percent of the times will be less than 99.7 seconds?
- What number of times above was actually less than 99.7seconds?
- Why do you think the two percentages don't agree? (Hint: graph data)

- 3. RUN FASTER** There are four runners on the New High School team. The team is planning to participate in a race in which each runner runs a mile. The team time is the sum of the individual times for the 4 runners. Assume that the individual times of the 4 runners are all independent of each other. The individual times, in minutes, of the runners in similar races are approximately normally distributed with the following means and standard deviations.

	Mean	Standard Deviation
Runner 1	4.9	0.15
Runner 2	4.7	0.16
Runner 3	4.5	0.14
Runner 4	4.8	0.15

- Runner 3 thinks that he can run a mile in less than 4.2 minutes in the next race. Is this likely to happen? (Hint: Find the proportion that he runs less than 4.2 minutes)
- The mean team time is 18.9 minutes with a standard deviation of 0.3003. Suppose the team's best time to date is 18.4 minutes. What is the probability that the team will beat its own time?
- What probability that the team will run faster than 18.5 minutes or slower than 19.1 minutes?

- 4. NCAA** The National Collegiate Athletic Association (NCAA) requires Division I athletes to score at least 820 on the combined mathematics and verbal parts of the SAT exam in order to compete in their first college year. (Higher scores are required for students with poor high school grades.) In 1999, the scores of the more than one million students taking the SATs were approximately normal with mean 1011 and standard deviation 219.

- What percent of all students had scores less than 820?
- The NCAA considers a student a "partial qualifier" eligible to practice and receive an athletic scholarship, but not to compete, if the combined SAT score is at least 720. Use the information in the previous exercise to find the percent of all SAT scores that are less than 720.